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March 29, 2019

Mr. Ravi Sanga
EPA Remedial Project Manager
U.S. EPA Region 10
1200 Sixth Avenue, ECL 111
Seattle, WA 98101

RE: Extraction Area Groundwater Remedial Action Progress Summary – Year 2018

Dear Mr. Sanga:

Please find enclosed three (3) copies of the *Extraction Area Groundwater Remedial Action Progress Summary – Year 2018*. An electronic version of the report is also included.

If you have any questions, please feel free to contact me at 541.812.7376.

Sincerely,

Noel Mak
NPL Program Coordinator

Enclosures: 1. *Extraction Area Groundwater Remedial Action Progress Summary – Year 2018*

Technical Memorandum

To: Noel Mak/ATI Millersburg Operations

From: Renee Fowler/GSI Water Solutions, Inc.
Libby Smith/GSI Water Solutions, Inc.
Kathy Roush/GSI Water Solutions, Inc.

Date: March 29, 2019

Re: **Extraction Area Groundwater Remedial Action Progress Summary – Year 2018**

This technical memorandum (TM) documents the groundwater extraction and treatment system (GETS) operations in the Extraction Area from the spring and fall of 2018 at the ATI Millersburg Operations (Oregon) (ATI) facility, formerly ATI Wah Chang (Figure 1). It also includes the results of biannual groundwater monitoring in one of two sub-areas of the Extraction Area: the Feed Makeup Area (FMA).

In the second sub-area, the South Extraction Area (SEA), chlorinated volatile organic compound (CVOC) concentrations remained low after implementation of a successful bioremediation pilot project and subsequent 5-year rebound monitoring program. In 2017, the U.S. Environmental Protection Agency (EPA) confirmed that the rebound monitoring period had been satisfied, that cleanup standards have been met, and that the area is considered protective (EPA, 2017). Therefore, the SEA is no longer monitored and is not discussed in this progress summary.

1. Background

The Extraction Area consists of the FMA and SEA, as shown in Figure 1. The well construction details for the monitoring wells are in Attachment A. All tables and figures are presented at the end of this TM. Previous groundwater monitoring results and GETS operational data from the SEA (through 2017) and FMA are referred to in this TM and have been summarized in the following documents:

- *South Extraction Area 1st Annual Monitoring Report (October 2000 through November 2001)* (CH2M HILL, December 10, 2001)
- *Extraction Area Remedial Action Progress Report – November 2001 through April 2002* (CH2M HILL, June 10, 2002)
- *Extraction Area Remedial Action Progress Report – May to December 2002* (CH2M HILL, February 7, 2003)

- *Extraction Area Remedial Action Progress Report – January to June 2003* (CH2M HILL, August 21, 2003)
- *Extraction Area Remedial Action Progress Report – July to December 2003* (CH2M HILL, February 2004)
- *Extraction Area Groundwater Year 2004 Remedial Action Progress Summary* (CH2M HILL, March 2005)
- *Wah Chang Extraction Area Groundwater Remedy 3-Year Evaluation* (CH2M HILL, September 2007)
- *Extraction Area Groundwater Year 2007 Remedial Action Progress Summary* (CH2M HILL, September 30, 2008)
- *Extraction Area Groundwater Year 2008 Remedial Action Progress Summary* (2008 annual report; GSI Water Solutions, Inc., March 12, 2009)
- *EISB Pilot Test Procedures and Initial Performance Summary, South Extraction Area, ATI Wah Chang Facility, Albany, Oregon,* (2009 SEA TM; GSI Water Solutions, Inc., March 26, 2009)
- *Extraction Area Groundwater Year 2009 Remedial Action Progress Summary* (2009 annual report; GSI Water Solutions, Inc., April 1, 2010)
- *EISB Pilot Test Summary, South Extraction Area, ATI Wah Chang Facility, Albany, Oregon* (2011 SEA TM; GSI Water Solutions, Inc., August 16, 2011)
- *Extraction Area Groundwater Year 2010 Remedial Action Progress Summary* (2010 annual report; GSI Water Solutions, Inc., August 15, 2011) (Revised with Response to EPA Comments dated June 3, 2011)
- *Feed Makeup Area – Second Lake Groundwater pH Sampling Transect Results* (2011 FMA TM; GSI Water Solutions, Inc., October 26, 2011)
- *Extraction Area Groundwater Year 2011 Remedial Action Progress Summary* (2011 annual report; GSI Water Solutions, Inc., September 5, 2012)
- *Feed Makeup Area Groundwater Focused Feasibility Study and Treatability Study Work Plan* (2013 work plan; GSI Water Solutions, Inc., January 11, 2013)
- *Feed Makeup Area Soil Flushing and Downgradient Buffer Barrier (*2013 Operations Plan; GSI Water Solutions, Inc., February 27, 2013)
- *Extraction Area Groundwater Year 2012 and 2013 Remedial Action Progress Summary* (2012 and 2013 annual report; GSI Water Solutions, Inc., June 15, 2015)
- *Extraction Area Groundwater Year 2014 Remedial Action Progress Summary* (2014 annual report; GSI Water Solutions, Inc., September 15, 2015)
- *Feed Makeup Area Groundwater Soil Flushing Project and Performance Summary* (2015 performance report; GSI Water Solutions, Inc., October 28, 2015)
- *Quality Assurance Project Plan for Site-Wide Remedial Actions* (QAPP; GSI Water Solutions, Inc., December 2015)
- *Extraction Area Groundwater Year 2015 Remedial Action Progress Summary* (2015 annual report; GSI Water Solutions, Inc., November 2, 2016)
- *Feed Makeup Area Groundwater Extraction System – Proposed Operational Modifications to Accelerate Attainment of Cleanup Levels at EW-2 and PW-28A; Revised Final* (2017 hydraulic testing work plan; GSI Water Solutions, Inc., June 12, 2017)
- *Sitewide Groundwater and Surface Water Sampling Results – 2016, Revised* (GSI Water Solutions, Inc., March 2018)
- *Feed Makeup Area Groundwater Extraction System – Operational Modifications to Accelerate Attainment of Cleanup Levels at EW-2 and PW-28A;* (2018 operational modifications; GSI Water Solutions, Inc., March 30, 2018)

- *Extraction Area Groundwater Year 2016-2017 Remedial Action Progress Summary* (2016-2017 annual report; GSI Water Solutions, Inc., December 19, 2018)

These documents provide detailed information that is not repeated in this TM. This TM discusses data collected for the biannual groundwater events from the FMA during 2018.

2. Feed Makeup Area

Industrial activities in the FMA consist of dissolving zirconium and hafnium tetrachloride in water and transferring the resulting feed solution to separation systems. A remedial investigation/feasibility study (RI/FS) (CH2M HILL, 1993) for the ATI facility indicated that groundwater in the FMA was acidic and contained elevated concentrations of dissolved metals, anions/cations, and radionuclides. Following completion of the RI/FS, EPA issued a Record of Decision (ROD) that specified groundwater pump-and-treat as the remedial alternative for hot spot areas (EPA, 1994). On April 10, 2002, GETS operations began in the FMA. This TM (2018 annual report) summarizes the remedial action progress associated with GETS operations.

Injections of buffer solutions in the FMA were completed in June 2013 to mitigate displaced low pH groundwater. Field parameter and analytical results from the FMA sampling were included in a post-injection performance report (GSI, 2015a) and in the 2015 remedial action progress summary (GSI, 2016). In 2017, EPA approved a work plan (GSI, 2017) to complete hydraulic testing to identify options for improving the effectiveness of the GETS in the FMA. The results and recommendation to complete two phases of modified pumping over two 6-month test periods were presented to EPA in March 2018 (GSI, 2018b). ATI is in the midst of these hydraulic tests and a summary of the findings and recommendations will be submitted to EPA upon completion in 2019.

3. Groundwater Monitoring

During 2018, ATI operated three extraction wells and collected groundwater samples at monitoring and extraction wells in the FMA. Groundwater levels were measured in both the FMA and SEA in 2018. Table 1 lists monitoring wells and extraction wells in the FMA and SEA, and the use of each well during 2018. Well locations are shown in Figure 1. The SEA wells are planned for removal in 2019.

Groundwater Elevations

Table 2 presents groundwater level measurements and calculated groundwater elevations recorded in 2018. Groundwater measurements in 2018 were synoptic and were used for groundwater elevation contouring. Figure 2a shows the groundwater elevations and contours during the spring of 2018 and Figure 2b shows the groundwater elevation and contours during the fall of 2018. Both figures represent the FMA. Although water levels were recorded at extraction wells and are included in Table 2, wells are not used in groundwater contours. Groundwater flow is generally toward the west in the FMA.

Groundwater Field Parameters

Groundwater samples were collected from FMA wells in 2018. Table 3 shows the field parameters recorded at the conclusion of groundwater purging before filling sample bottles. A YSI 556 multiparameter instrument connected to a closed flow-through cell was used to measure field parameters during purging of the wells. The instrument was calibrated daily using fresh calibration standards recommended by the instrument manufacturer. With the exception of PW-21A, the field data displayed in Table 3 are those recorded after achieving stable values for each groundwater parameter during well purging.

Quality Control Program

Groundwater monitoring in 2018 was completed in conformance with the quality assurance project plan (QAPP; GSI, 2015b). All samples were immediately placed in iced coolers and maintained under chain-of-custody protocols. ATI or GSI Water Solutions, Inc. (GSI), personnel delivered samples to the laboratory (Apex Laboratory in Tigard, Oregon) during collection periods.

Duplicate samples for field quality control (QC) were collected at a frequency of 5 percent of the samples collected during the event. All duplicate samples were collected at the same time as the parent sample, and were blind-labeled and delivered to Apex with the normal shipment. Matrix spike and matrix spike duplicate samples also were collected at a frequency of 5 percent and when potential changes in the sample matrix were anticipated because of previous sampling results. Apex provided the use of approved analytical methods according to the QAPP, analytical data package deliverables, and conformance with the laboratory's quality assurance (QA) manual.

Field and laboratory data were subjected to a formal verification and validation process in accordance with EPA guidance documents, as described in the QAPP. An external party, as defined in EPA's *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA, 2009), QA/QC Solutions, LLC, performed the data validation to determine the usability of the data for meeting project objectives. An abbreviated validation review (i.e., a summary review of the results reported) was performed on 90 percent the data and a more comprehensive validation review was performed on 10 percent of the data, as described in Section D.1 of the QAPP.

Data qualifiers were assigned during data validation to the electronic data deliverables (EDDs) when applicable QA and QC limits were not met and the qualification was warranted following guidance specified by EPA (EPA, 2002, 2008, and 2010), QC requirements specified in the QAPP, and method-specific QC requirements, as applicable. Final, qualified (as necessary) laboratory results were transmitted in EDDs for data management, further evaluation, and reporting.

After verification and validation of the field and laboratory data, as described above, data completeness was calculated by comparing the total number of acceptable data (non-rejected data) to the total number of data points generated. Overall, completeness for the 2018 sampling events was 100 percent (i.e., no data were rejected).

Groundwater Analytical Monitoring

Groundwater samples collected in the spring and fall of 2018 were analyzed for ammonium, arsenic, cadmium, chloride, fluoride, nickel, total dissolved solids (TDS), radium-226, and radium-228. Results are presented in Table 4. Attachment B presents historical groundwater analytical results for samples collected in the FMA from 2009 to 2018.

In 2016, a sitewide sampling event was conducted with additional constituents analyzed that are not routine for the biannual groundwater monitoring event (GSI, 2018a). Some wells had cleanup standard exceedances for constituents not included in the biannual groundwater monitoring. These constituents were resampled in 2018 for verification and evaluation purposes. However, dissolved metals were not resampled as total metals will be used for evaluation. Table 5 presents the 2016 sitewide results and the 2018 resample results. Total beryllium at PW-28A was neglected to be collected and will be resampled in 2019. Although some 2018 resampled results were below the cleanup standard, several results for total beryllium, pentachlorophenol, and nitrate remained above the cleanup standard from 2016. ATI will use these data to determine what modifications are needed to the monitoring program and the revisions will be proposed to EPA in the Sitewide Exceedance Analysis report, to be submitted in May 2019.

As part of the GETS hydraulic test, wells PW-102 and PW-103 were sampled in the spring of 2018. The field parameters and radium-226/228 results are shown in Table 3 and Table 4, respectively.

Time Trends for Constituents of Concern

Time-trend plots are presented, as requested by EPA, for the constituents of concern (COCs): pH, fluoride, and radionuclides. Figure 3 displays pH trends for any FMA well that has exceeded the cleanup standard in the last 5-year period (2014 through 2018). pH was not measured in the extraction wells at the time of sampling in 2018. Seven monitoring wells were outside of the pH cleanup standard range (6.5 to 8.5).

Combined concentrations for radium-226 and radium-228 over time are shown in Figure 4. As in 2017, the highest concentration was at monitoring well PW-28A (46 picocuries per liter [pCi/L] in the spring of 2018) and its nearby extraction well EW-2 (22.3 pCi/L in the fall of 2018). Monitoring well PW-21A, which was below the combined radium-226/228 cleanup standard (5 pCi/L) from 2012 until the fall of 2017, exceeded the cleanup standard in the fall of 2018 with a combined detection of 5.5 pCi/L. Monitoring well PW-50A exceeded the cleanup standard in both the spring (9.4 pCi/L) and fall (10.3 pCi/L) of 2018; and both PW-52A and EW-1 exceeded the cleanup standard in the fall of 2018 (5.45 and 7.77 pCi/L, respectively). The total number of monitoring and extraction wells below the cleanup standard decreased from nine wells in 2017 to six wells in 2018.

In 2018, five wells exceeded the fluoride cleanup level of 4 milligrams per liter (mg/L) with the highest concentration of 25.2 mg/L in well PW-23A. Figure 5 includes all wells that have exceeded the cleanup standard at any time since 2013.

4. Extraction Well Operational Parameters

System Overview

Extraction wells in the FMA operated throughout 2018 and extracted 201,436 gallons of groundwater. Table 6 presents the total combined pumping volume from FMA extraction wells EW-1, EW-2, and EW-3 for 2002 through 2018, and the year-end combined pH values for the wells.

Operations Summary

Pumping volumes in the FMA are influenced primarily by the limited groundwater flow potential in the subsurface. Extraction volumes are not limited by the performance capabilities of the GETS. Figure 6 shows the pumping volumes month by month for each of the FMA extraction wells from 2014 through 2018. Table 7 illustrates the 2018 pumping volumes, average daily flow, and average well performance for each extraction well. The average well performance data displayed in Table 7 take into account the actual minutes the pumps were operated during the year.

Groundwater pumped from the GETS is treated and processed in the Central Wastewater Treatment System; then, as of November 2011, the water is discharged to the publicly owned treatment works (POTW). These activities are conducted in compliance with the ATI POTW permit.

Hydraulic testing of the GETS began in August 2017 to identify options for improving the effectiveness of the GETS. In 2018, extraction well EW-2 was off from January through April for the pump test. Extraction wells EW-1 and EW-3 were off from May through December 2018. Hydraulic testing has continued into 2019.

Extraction Volumes

The GETS removed 4,863 pounds of TDS from 201,436 gallons of groundwater in 2018 (Table 8). Historically, TDS has been used as the overall indicator of contaminant mass recovery. However, mass recovery also is presented in terms of the individual COCs in the FMA. Table 8 presents the mass recovery of COCs and is derived directly from monthly groundwater volumes recorded at the three extraction wells, and the quarterly and semiannual analytical results.

5. Conclusions

Extraction well operations data and groundwater sampling results from 2018 indicate that:

- Concentrations of fluoride and combined radium isotopes exceeded cleanup standards in at least one FMA well during the monitoring period.
    - Fluoride: Five FMA wells exceeded the cleanup standard for fluoride (4 mg/L) in 2018. The highest concentration, 25.2 mg/L, was observed in well PW-23A.

    - Radium: The combined radium-226 and radium-228 concentrations were below the cleanup standard (5 pCi/L) in eight wells and above the cleanup standard in six wells.

- Routine operations of the GETS has been interrupted with a hydraulic test. Extraction wells EW-1 and EW-3 were operational from January through April 2018 and extraction well EW-2 was operational from May through December 2018. ATI will provide EPA with a summary of the results of the GETS hydraulic test in 2019.
- ATI will continue to monitor all wells in the FMA in accordance with Section 10.1.1.3 of the ROD and additional performance monitoring associated with the GETS hydraulic tests as outlined in the *Feed Makeup Area Groundwater Extraction System – Operational Modifications to Accelerate Attainment of Cleanup Levels at EW-2 and PW-28A* (GSI, 2018b).

6. Summary

During FMA GETS monitoring in 2018, ATI monitored groundwater elevations, field parameters, and COC concentrations. Mass recovery has been presented in terms of the COCs in the FMA. ATI will continue to monitor FMA wells in accordance with Section 10.1.1.3 of the ROD. ATI started a GETS hydraulic test in August 2017 that will continue into 2019. ATI will provide EPA with a summary of the findings and recommendations of the GETS hydraulic test following completion.

With the SEA having met cleanup standards and EPA considering the area protective, ATI will petitioned EPA in 2019 to begin removing wells in the SEA.

7. References

CH2M HILL. 1993. Remedial Investigation/Feasibility Study - Teledyne Wah Chang Albany.

EPA. 1994. Record of Decision: Declaration, Decision Summary, and Responsiveness Summary for Final remedial Action of Groundwater and Sediments Operable Unit – Teledyne Wah Chang Albany Superfund Site, Millersburg, Albany. U.S. Environmental Protection Agency (EPA).

EPA. 2002. Guidance on Environmental Data Verification and Validation. EPA QA/G-8. EPA/240/R-02/004. U.S. Environmental Protection Agency (EPA). November 2002.

EPA. 2008. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review. EPA-540/R-08/01. U.S. Environmental Protection Agency (EPA). June 2008.

EPA. 2009. Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use. EPA 540-R-08-005. U.S. Environmental Protection Agency (EPA). January 2009.

EPA. 2010. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review. EPA-540/R-10/011. U.S. Environmental Protection Agency (EPA). January 2010.

EPA. 2017. Fifth Five-Year Review Report for Teledyne Wah Change Superfund Site, Linn County, Oregon. U.S. Environmental Protection Agency (EPA). December 18, 2017.

GSI. 2015a. Feed Makeup Area Groundwater Soil Flushing Project and Performance Summary. Prepared by GSI Water Solutions, Inc. (GSI). October 28, 2015.

GSI. 2015b. Quality Assurance Project Plan for Site-Wide Remedial Actions. Prepared by GSI Water Solutions, Inc. (GSI). December 2015.

GSI. 2016. Extraction Area Groundwater Year 2015 Remedial Action Progress Summary. Prepared by GSI Water Solutions, Inc. (GSI). November 2016.

GSI. 2017. Feed Makeup Area Groundwater Extraction System – Proposed Operational Modifications to Accelerate Attainment of Cleanup Levels at EW-2 and PW-28A; Revised Final. Prepared by GSI Water Solutions, Inc. (GSI). June 2017

GSI. 2018a. Sitewide Groundwater and Surface Water Sampling Results – 2016, Revised. Prepared by GSI Water Solutions, Inc. (GSI). March 2018.

GSI. 2018b. Feed Makeup Area Groundwater Extraction System – Operational Modifications to Accelerate Attainment of Cleanup Levels at EW-2 and PW-28A. Prepared by GSI Water Solutions, Inc. (GSI). March 30, 2018.

Table 1. Extraction Area Monitoring Activities in 2018

ATI Millersburg Operations, Oregon

Well	Area	Groundwater Monitoring				Extraction Well Operation and Monitoring
		Groundwater Elevations		Groundwater Sampling		
		Spring	Fall	Spring	Fall	
PW-21A	FMA	X	X	X	X	
PW-22A	FMA	X	X	X	X	
PW-23A	FMA	X	X	X	X	
PW-24A	FMA	X	X	X	X	
PW-27A	FMA	X	X	X	X	
PW-28A	FMA	X	X	X	X	
PW-50A	FMA	X	X	X	X	
PW-51A	FMA	X	X	X	X	
PW-52A	FMA	X	X	X	X	
EW-1	FMA	X	X	X	X	X
EW-2	FMA			X	X	X
EW-3	FMA	X	X	X	X	X
PW-25A	SEA	X	X			
PW-26A	SEA	X	X			
PW-29A	SEA	X	X			
PW-47A	SEA	X	X			
PW-48A	SEA	X	X			
PW-49A	SEA	X	X			
PW-57A	SEA	X	X			
PW-96A	SEA	X	X			
PW-97A	SEA	X	X			
EW-4	SEA	X	X			
EW-5	SEA	X	X			
EW-6	SEA	X	X			

Notes:

FMA = Feed Makeup Area

SEA = South Extraction Area

EW designation indicates extraction well.

PW designation indicates monitoring well.

Groundwater sampling included collecting samples for laboratory analysis of ammonium, arsenic, cadmium, chloride, fluoride, nickel, total dissolved solids, and radium-226/228.

SEA is no longer monitored as cleanup levels have been met and EPA considers the area protective (EPA, 2017)

Table 2. Extraction Area Wells Groundwater Elevation in 2018

ATI Millersburg Operations, Oregon

			Spring		Fall	
Well	**Area**	**TOC Elev** (ft amsl)	**DTW** (ft bgs)	**GW Elev** (ft amsl)	**DTW** (ft bgs)	**GW Elev** (ft amsl)
PW-21A	FMA	209.36	22.06	187.30	23.50	185.86
PW-22A	FMA	210.37	18.79	191.58	19.45	190.92
PW-23A	FMA	212.02	20.84	191.18	21.86	190.16
PW-24A	FMA	212.05	21.08	190.97	23.14	188.91
PW-27A	FMA	210.99	14.70	196.29	16.82	194.17
PW-28A	FMA	209.13	14.60	194.53	15.50	193.63
PW-50A	FMA	209.08	15.60	193.48	16.55	192.53
PW-51A	FMA	209.27	14.04	195.23	15.91	193.36
PW-52A	FMA	210.36	14.21	196.15	15.79	194.57
EW-1	FMA	209.77	13.08	196.69	15.63	194.14
EW-2	FMA	209.66	--	--	--	--
EW-3	FMA	210.18	13.78	196.40	15.73	194.45
PW-25A	SEA	211.88	12.20	199.68	23.70	188.18
PW-26A	SEA	213.18	24.87	188.31	25.49	187.69
PW-29A	SEA	214.22	19.88	194.34	21.40	192.82
PW-47A	SEA	210.79	23.83	186.96	25.32	185.47
PW-48A	SEA	214.50	18.43	196.07	19.51	194.99
PW-49A	SEA	216.98	29.60	187.38	30.44	186.54
PW-57A	SEA	210.87	24.21	186.66	25.15	185.72
PW-96A	SEA	210.54	21.63	188.91	22.78	187.76
PW-97A	SEA	210.24	24.04	186.20	24.59	185.65
EW-4	SEA	210.00	21.04	188.96	21.79	188.21
EW-5	SEA	208.92	20.29	188.63	21.89	187.03
EW-6	SEA	208.70	20.10	188.60	21.42	187.28

Notes:

-- = Water level was not measured due to pumping conditions

DTW = depth to water

FMA = Feed Makeup Area

ft amsl = feet above mean sea level

ft bgs = feet below ground surface

GW Elev = groundwater elevation

SEA = South Extraction Area

TOC = top of casing

Table 3. Extraction Area Groundwater Field Parameters in 2018

ATI Millersburg Operations, Oregon

	Temperature (˚C)		Specific Conductance (µS/cm)		Dissolved Oxygen (mg/L)		pH (unit)		Oxidation-Reduction Potential (mV)	
Well	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Cleanup Standard	--		--		--		*6.5 - 8.5* [1]		--	
PW-21A[2]	16.1	15.9	630	1,254	7.2	0.53	5.01	5.08	150.2	295.1
PW-22A	16.0	15.3	1,203	1,227	0.08	0.13	6.70	7.01	-36.0	-52.7
PW-23A	18.2	17.3	571	506	0.11	0.11	6.52	7.10	102.1	-42.6
PW-24A	16.9	16.2	1,735	2,549	0.17	0.24	6.03	6.58	172.3	94.2
PW-27A	16.3	16.2	1,905	1,977	0.20	0.23	5.77	6.27	151.1	122.6
PW-28A	17.3	16.0	8,236	10,875	0.99	4.63	4.00	3.62	197.5	257.8
PW-50A	16.2	16.3	3,730	4,275	0.37	0.25	4.01	3.59	77.6	321.0
PW-51A	17.4	17.24	4,042	4,143	0.18	0.55	6.15	6.35	149.7	198.8
PW-52A	16.7	18.07	5,452	6,078	0.60	0.46	3.50	3.44	302.8	307.9
PW-102[3]	17.2	--	860	--	0.07	--	6.13	--	102.1	--
PW-103[3]	15.4	--	1,337	--	0.19	--	5.43	--	135.9	--

Notes:

[1] The cleanup standard is the U.S. Environmental Protection Agency drinking water secondary maximum contaminant level (SMCL).

[2] Monitoring well PW-21A went dry before parameter stabilization.

[3] Wells PW-102 and PW-103 were sampled for Feed Makeup Area (FMA) hydraulic test and are not included in Table B-1 of the Quality Assurance Project Plan for Site-Wide Remedial Actions (GSI, 2015b).

µS/cm = microSiemen per centimeter

°C = degrees Celsius

mg/L = milligrams per liter

mV = millivolt

Table 4. Extraction Area Groundwater Analytical Results in 2018

ATI Millersburg Operations, Oregon

Well	Sampling Event	Arsenic (mg/L)	Ammonium (mg/L)	Cadmium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nickel (mg/L)	Radium 226 (pCi/L)	Radium 228 (pCi/L)	TDS (mg/L)
Cleanup Standard		*0.01*	*250*	*0.005*	*None*	*4*	*None*	*5 (combined)*		*None*
PW-21A	Spring	0.001 U	56.1	0.0000818 J	7.63	1.54	0.00542	0.13	0.65	330
	Fall	0.001 U	114	0.0000767 J	24.5	2.66	0.00983	**1.4**	**4.1**	456
PW-22A	Spring	0.00417	117	0.0002 U	134	3.32	0.001 U	0.17	0.64	380
	Fall	0.0044	107	0.0002 U	146	3.00	0.001 U	0.13 J	1.5	346
PW-23A	Spring	0.0049	52.8	0.0002 U	28.4	**23.0**	0.001 U	0.13	0.17	236
	Fall	0.00486	38.4	0.0002 U	23.2	**25.2** J	0.001 U	0.15 J	1.5	210
PW-24A	Spring	0.001 U	158	0.0000434 J	99.1	1.00 U	0.00125	0.13	1.4	808
	Fall	0.001 U	184	0.0000452 J	176	1.00 U	0.00284	0.13 J	-0.79	2,240
PW-27A	Spring	0.001 U	19.5	0.000069 J	436	1.00 U	0.00212	0.13	0.65	1,750
	Fall	0.001 U	10.7	0.0000738 J	471	1.00 U	0.00098 J	0.13 J	1.2	1,570
PW-28A	Spring	0.0027	173	**0.00585**	3,820	100 U	0.875	**19**	**27**	6,480
	Fall	0.009 U	6.01	**0.0273**	103	1.05	0.0309	0.53	1.4	198
PW-50A	Spring	0.00153	10.1	**0.0253**	1,090	1.08	0.068	**2**	**7.4**	3,560
	Fall	0.00274 J	63.3	**0.00572**	1,370	**6.03**	0.497	**1**	**9.3**	2,540
PW-51A	Spring	0.00148 J	119	0.00112	891	1.18	0.0978	0.2	1.2	3,140
	Fall	0.00207	109	0.00117	851	1.28	0.069	0.38	0.33	3,660
PW-52A	Spring	0.00554	114	**0.00559**	1,800	**17.8**	0.689	0.27	3.7	3,790
	Fall	0.00889	178	**0.00633**	1,880	1.00 U	0.964	**0.35**	**5.1**	363
PW-102A	Spring	NS	NS	NS	NS	NS	NS	0.16	-0.04	NS
PW-103A	Spring	NS	NS	NS	NS	NS	NS	0.22	3.9	NS
EW-1	Spring	0.00494	54.3	**0.00979**	2,170	1.00 U	0.611	0.92	3.9	6,580
	Fall	0.00313 J	61.5	**0.00864**	2,440	**11.2**	0.743	**0.67**	**7.1**	4,380

Table 4. Extraction Area Groundwater Analytical Results in 2018

ATI Millersburg Operations, Oregon

Well	Sampling Event	Arsenic (mg/L)	Ammonium (mg/L)	Cadmium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nickel (mg/L)	Radium 226 (pCi/L)	Radium 228 (pCi/L)	TDS (mg/L)
Cleanup Standard		*0.01*	*250*	*0.005*	*None*	*4*	*None*	*5 (combined)*		*None*
EW-2	Spring	0.00444	49.0	**0.0216**	1,970	1.00 U	0.63	**4.7**	**15**	4,350
	Fall	0.00327	50.3	**0.0177**	2,350	1.98	0.716	**3.3**	**19**	3,830
EW-3	Spring	0.00122	38.3	0.00153	395	**6.16**	0.119	0.06	0.39	2,010
	Fall	0.005 U	32.8	0.00159	527	**15.2**	0.161	0.05	0.1	1,440

Notes:

J = estimated value below method reporting limit

mg/L = milligram per liter

NS = not sampled

pCi/L = picocuries per liter

TDS = total dissolved solids

U = analyte not detected above method reporting limit

Bold indicates detected concentration meets or exceeds the cleanup standard.

Table 5. Extraction Area Sitewide Exceedance Resampling

ATI Millersburg Operations, Oregon

Well	Analyte	Cleanup Level	Units	2016 Sitewide Result	Resample Date	2018 Resample Result
EW-1	Beryllium, Dissolved	1	µg/L	**13.8**	--	--
	Beryllium, Total	1	µg/L	**16.1**	10/30/2018	**12.9**
	Pentachlorophenol	1	µg/L	**3.63**	10/30/2018	0.215 U
EW-2	Beryllium, Dissolved	1	µg/L	**9.56**	--	--
	Beryllium, Total	1	µg/L	**10.7**	10/30/2018	**9.75**
	Cadmium, Dissolved	5	µg/L	**11.8**	--	--
	Chromium, Dissolved	100	µg/L	**659**	--	--
	Pentachlorophenol	1	µg/L	**3.51**	10/30/2018	0.138
	Uranium, Dissolved	0.03	mg/L	**0.0394**	--	--
	Uranium, Total	0.03	mg/L	**0.0435**	10/30/2018	0.0191
EW-3	Pentachlorophenol	1	µg/L	**4.08**	10/30/2018	1.7
PW-21A	Nitrate	10	mg/L	**15.8**	10/18/2018	**107**
PW-24A	Nitrate	10	mg/L	**16.6**	10/11/2018	**14.2**
PW-27A	Nitrate	10	mg/L	**42.2**	10/11/2018	**27.9**
PW-28A	Beryllium, Dissolved	1	µg/L	**3.46**	--	--
	Beryllium, Total	1	µg/L	**3.75**	10/31/2018	--
	Uranium, Total	0.03	mg/L	**0.0313**	10/31/2018	0.001 U
PW-50A	Beryllium, Total	1	µg/L	**3.08**	10/30/2018	**7.51**
	Pentachlorophenol	1	µg/L	**30.4**	10/30/2018	**17.5**
PW-51A	Nitrate	10	mg/L	**107**	10/18/2018	**74.0**
PW-52A	Beryllium, Dissolved	1	µg/L	**18.8**	--	--
	Beryllium, Total	1	µg/L	**20**	10/18/2018	**23.6**
	Nitrate	10	mg/L	**21**	10/18/2018	0.250 U

Notes:

-- = not analyzed; dissolved constituents were not resampled

µg/L = microgram per liter

mg/L = milligram per liter

U = analyte not detected above method reporting limit

Bold indicates detected concentration meets or exceeds the cleanup standard.

Table 6. FMA Extraction Well Operation from 2002 through 2018
ATI Millersburg Operations, Oregon

Year	FMA Annual Pumping (gallons)	FMA Year-End pH
2002	205,414	1.89
2003	337,628	2.14
2004	305,719	2.35
2005	255,875	2.45
2006	315,469	2.69
2007	431,296	4.2
2008	326,529	2.47
2009	389,454	3.64
2010	408,272	4.06
2011	379,151	4.07
2012	410,383	4.25
2013	231,484	5.67
2014	177,694	5.23
2015	215,559	5.11
2016	149,206	4.99
2017	148,498	4.96
2018	201,436	4.21
Total	4,726,999	

Note:
FMA = Feed Makeup Area
pH taken from meter plumbed directly to combined extraction flow.

Table 7. FMA Extraction Well Summary in 2018

ATI Millersburg Operations, Oregon

Well	Annual Pumping Volume (gallons)	Average Daily Flow[1] (gallons per day)	Average Well Performance[2] (gallons per minute)
EW-1	20,429	56.0	0.04
EW-2	90,516	248	0.17
EW-3	90,491	248	0.17
Total	201,436	552	0.38

Notes:

[1] Sum of total gallons recorded divided by the days in the year.

[2] Average of total gallons recorded divided by total run time minutes recorded during the year.

FMA = Feed Makeup Area

Table 8. FMA Mass Recovery for Constituents of Concern in 2018

ATI Millersburg Operations, Oregon

Ammonium (lbs.)	**Fluoride** (lbs.)	**Manganese** (lbs.)	**Nickel** (lbs.)	**TDS** (lbs.)	**Radium-226** (lbs.)	**Radium-228** (lbs.)
99.39	4.37	--	0.01	4,863	5.87E-09	1.99E-08

Notes:

-- = not analzyed

FMA = Feed Makeup Area

lbs = pounds

TDS = total dissolved solids

Mass recovery for radium-226 and radium-228 is based on specific activities of 1 pCi = 1×10^{-12} grams and 1 pCi = 2.3×10^{-10} grams, respectively.

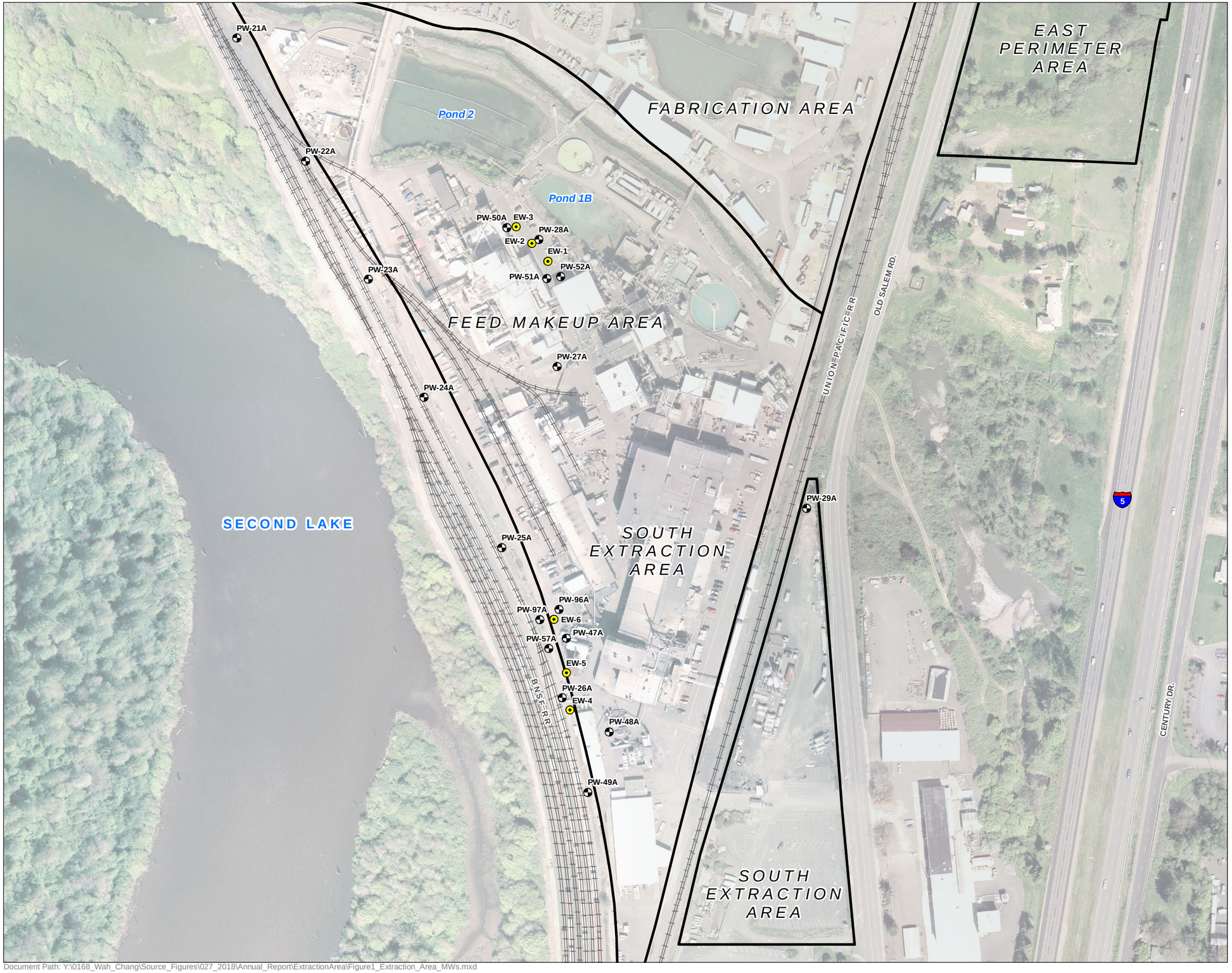


FIGURE 1

Extraction Area Monitoring Wells

ATI Millersburg Operations, Oregon

LEGEND

- Monitoring Well
- Extraction Well
- Railroad

NOTE:
The South Extraction Area (SEA) is no longer monitored as cleanup levels have been met and EPA considers the area protective (EPA, 2017); therefore, the SEA is not discussed in this progress summary.

N

0 100 200 300
Feet

Date: March 22, 2019
Data Sources: City of Albany GIS, Wah Chang

GSI Water Solutions, Inc.

Document Path: Y:\0168_Wah_Chang\Source_Figures\027_2018\Annual_Report\ExtractionArea\Figure1_Extraction_Area_MWs.mxd

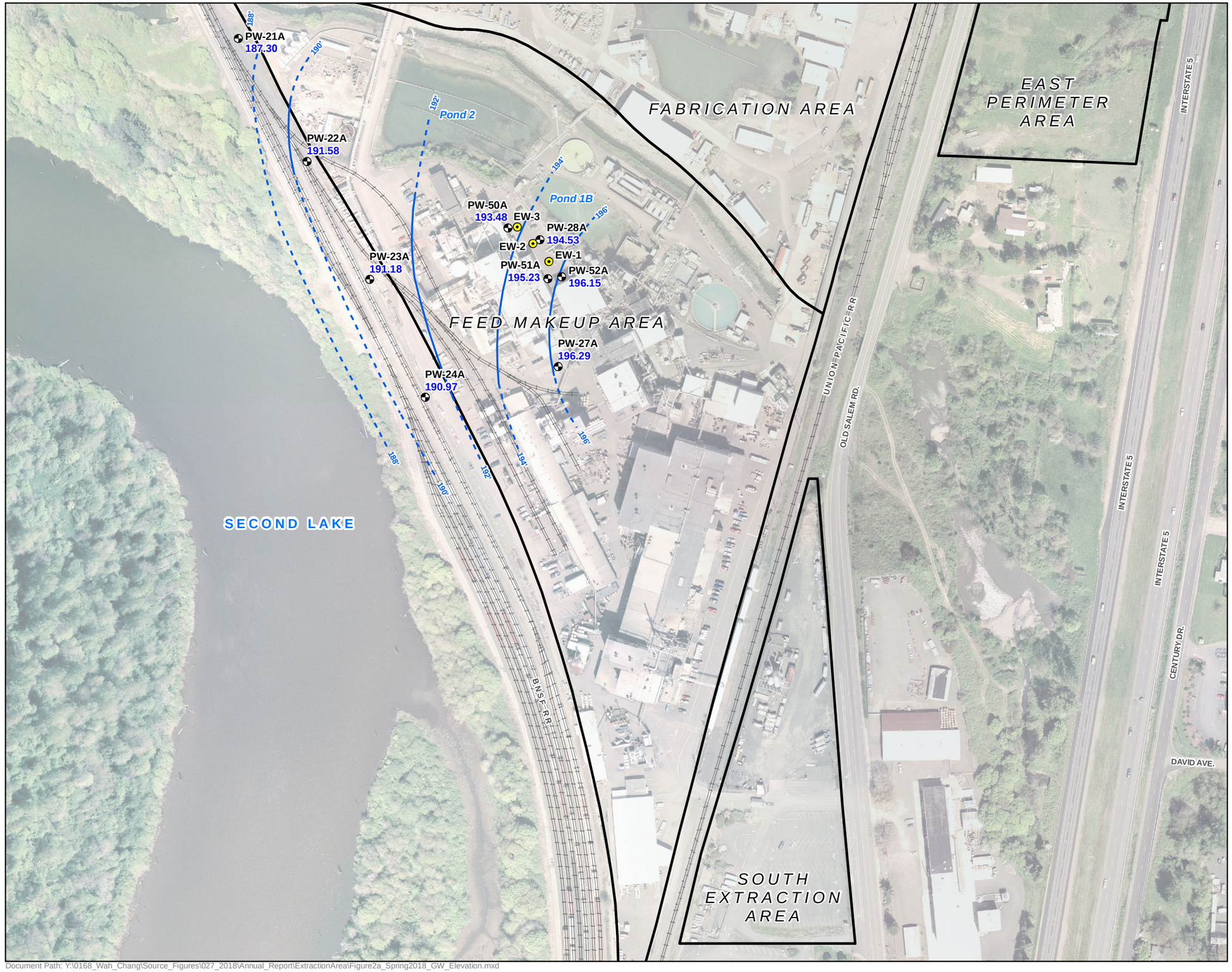


FIGURE 2a

Spring 2018 Groundwater Elevations in Extraction Area

ATI Millersburg Operations, Oregon

LEGEND

- Monitoring Well
- Extraction Well
- Groundwater Contour (dashed where inferred)
- Railroad

NOTE:

1. The South Extraction Area (SEA) is no longer monitored as cleanup levels have been met and EPA considers the area protective (EPA, 2017); therefore, the SEA is not discussed in this progress summary.
2. Pond elevations are variable and controlled by flood switches. Ponds discharge to Publically Owned Treatment Works (POTW) wetlands.

N

0 100 200 300
Feet

Date: March 19, 2019
Data Sources: City of Albany GIS, Wah Chang

GSI Water Solutions, Inc.

Document Path: Y:\0168_Wah_Chang\Source_Figures\027_2018\Annual_Report\ExtractionArea\Figure2a_Spring2018_GW_Elevation.mxd

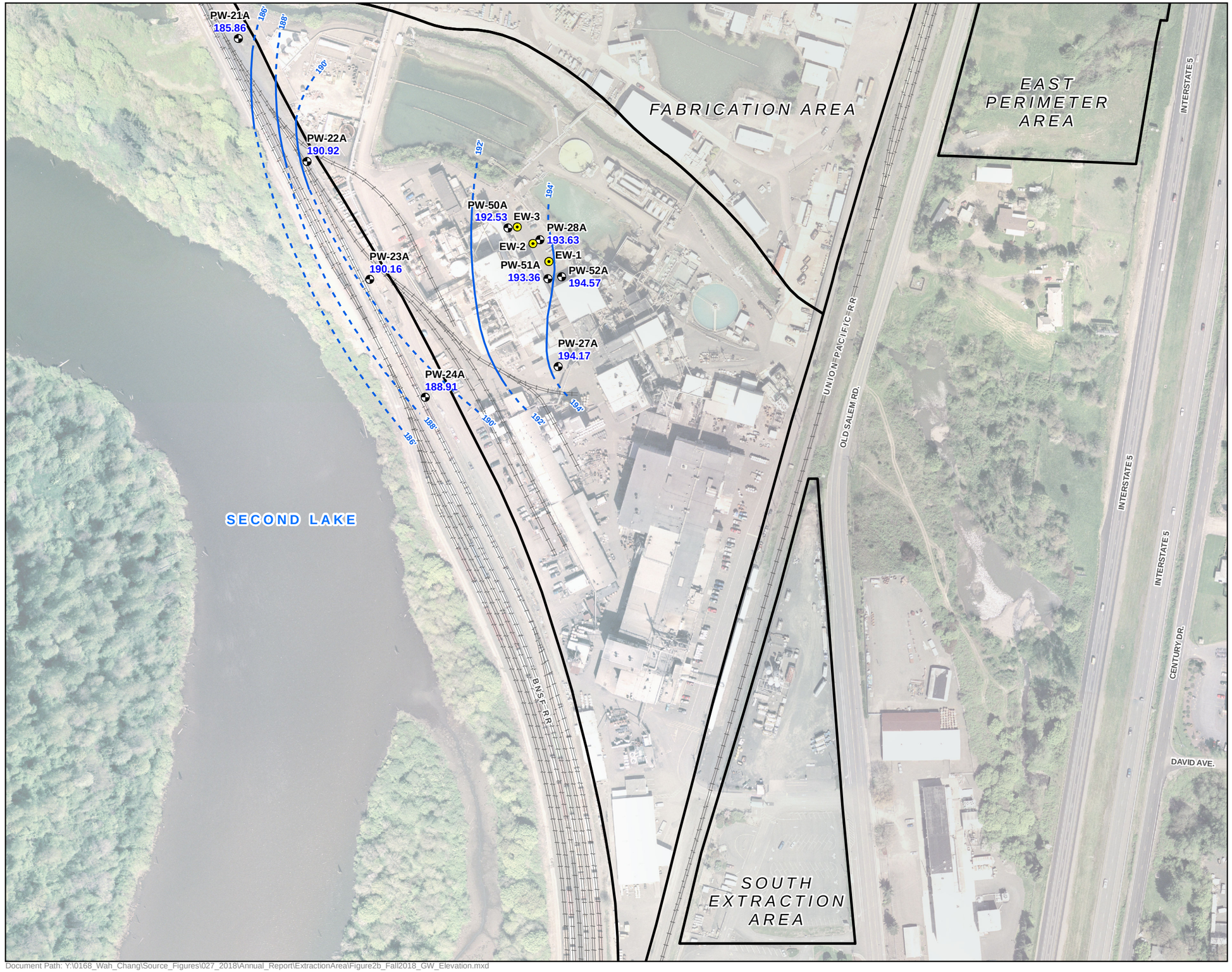


FIGURE 2b

Fall 2018 Groundwater Elevations in Extraction Area

ATI Millersburg Operations, Oregon

LEGEND

- Monitoring Well
- Extraction Well
- Groundwater Contour (dashed where inferred)
- Railroad

NOTE:

1. The South Extraction Area (SEA) is no longer monitored as cleanup levels have been met and EPA considers the area protective (EPA, 2017); therefore, the SEA is not discussed in this progress summary.
2. Pond elevations are variable and controlled by flood switches. Ponds discharge to Publically Owned Treatment Works (POTW) wetlands.

N

0 100 200 300

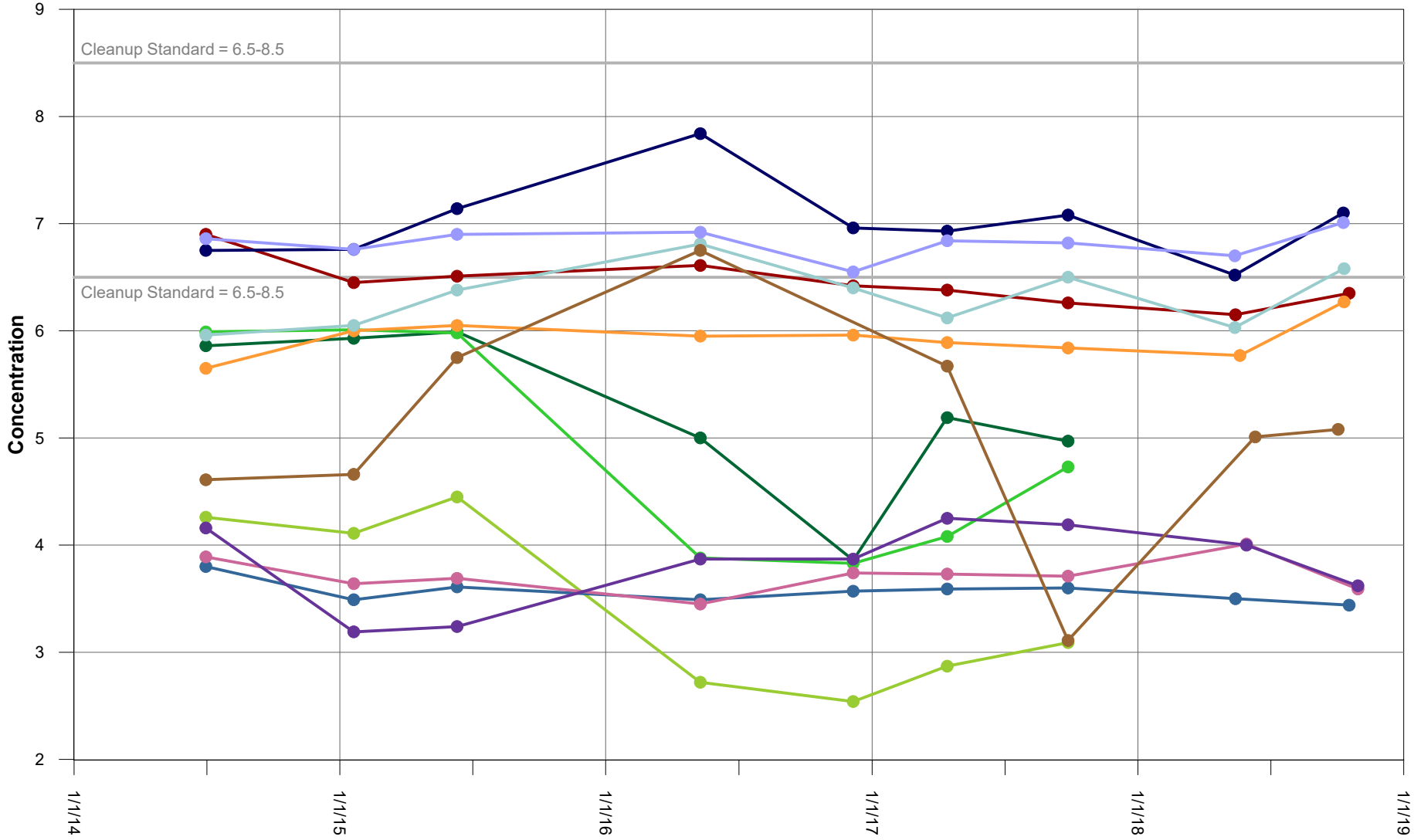
Feet

Date: March 19, 2019

Data Sources: City of Albany GIS, Wah Chang

GSI Water Solutions, Inc.

Document Path: Y:\0168_Wah_Chang\Source_Figures\027_2018\Annual_Report\ExtractionArea\Figure2b_Fall2018_GW_Elevation.mxd



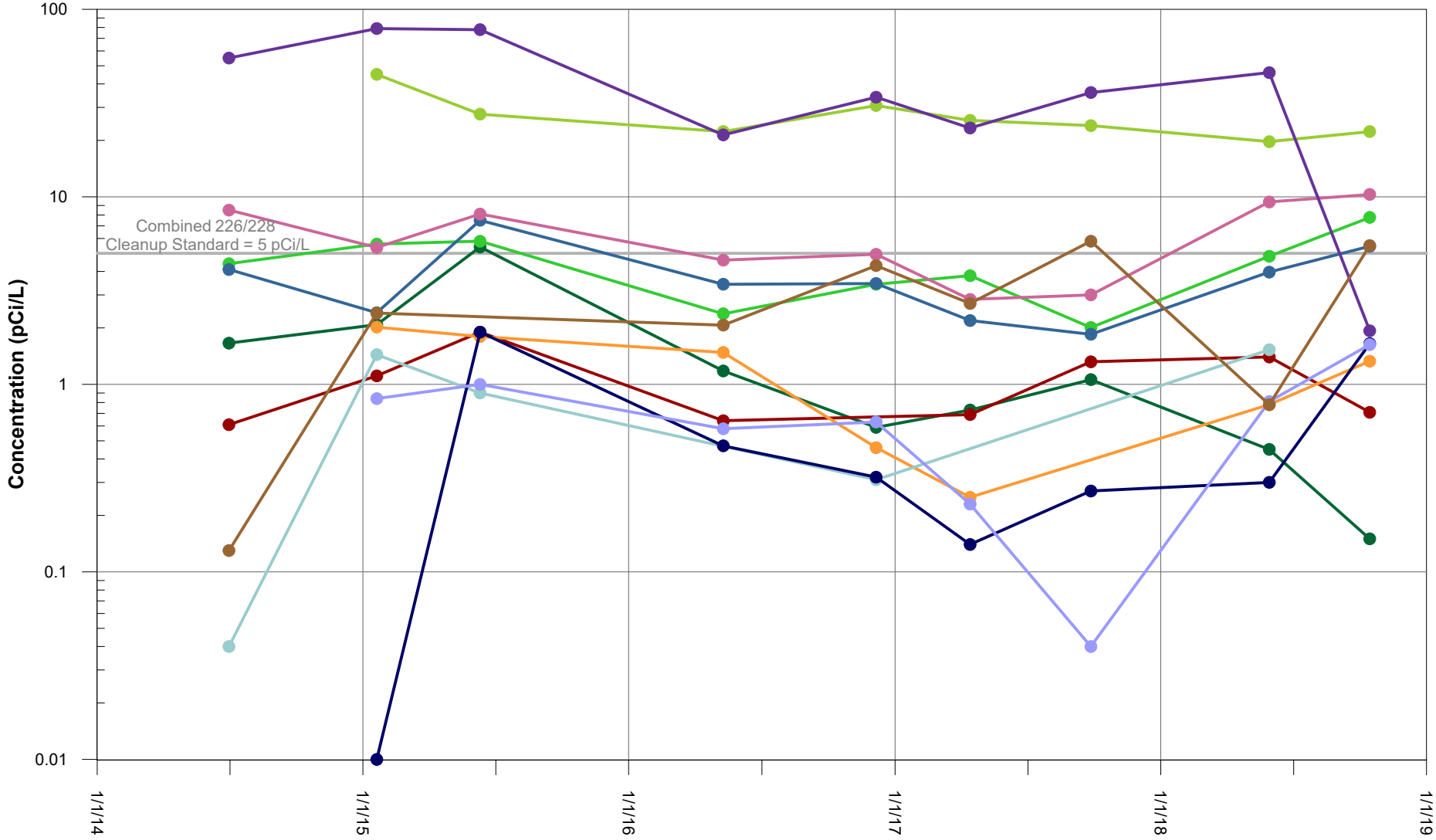
Legend:

EW-1 PW-21A PW-24A PW-50A
EW-2 PW-22A PW-27A PW-51A
EW-3 PW-23A PW-28A PW-52A

FIGURE 3
Feed Makeup Area
pH Concentration Trends
ATI Millersburg Operations, Oregon

Notes:
5-year rolling plot displays all wells in the provided timeframe.

GSI Water Solutions, Inc.



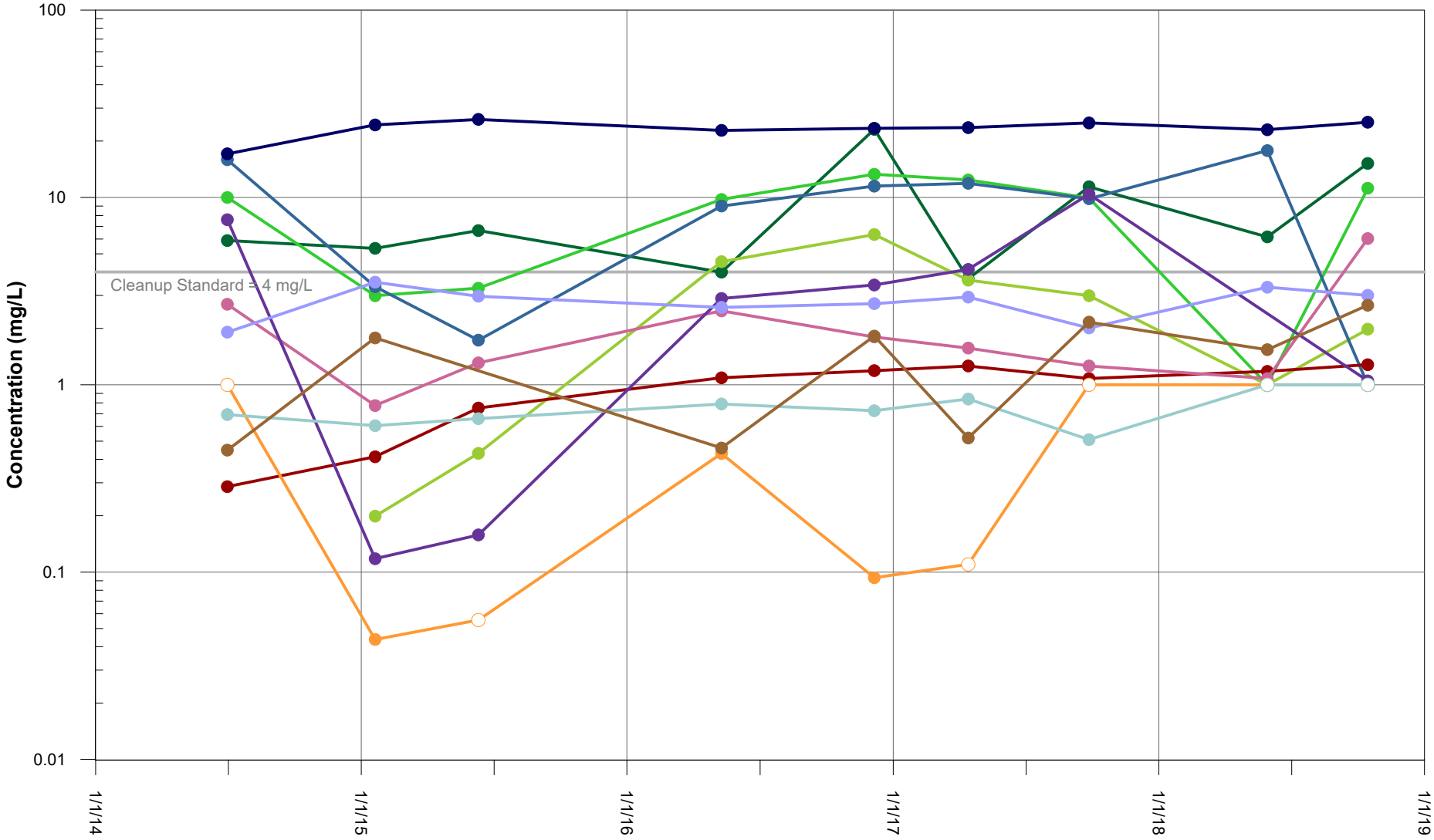
Legend:

EW-1 EW-2 EW-3 PW-21A PW-22A PW-23A PW-24A PW-27A PW-28A PW-50A PW-51A PW-52A

FIGURE 4
Feed Makeup Area
Combined Radium 226/228 Concentration Trends
ATI Millersburg Operations, Oregon

Notes:
pCi/L = picocuries per liter
5-year rolling plot displays all wells in the provided timeframe. For historical data, see table in Attachment B.

GSI Water Solutions, Inc.



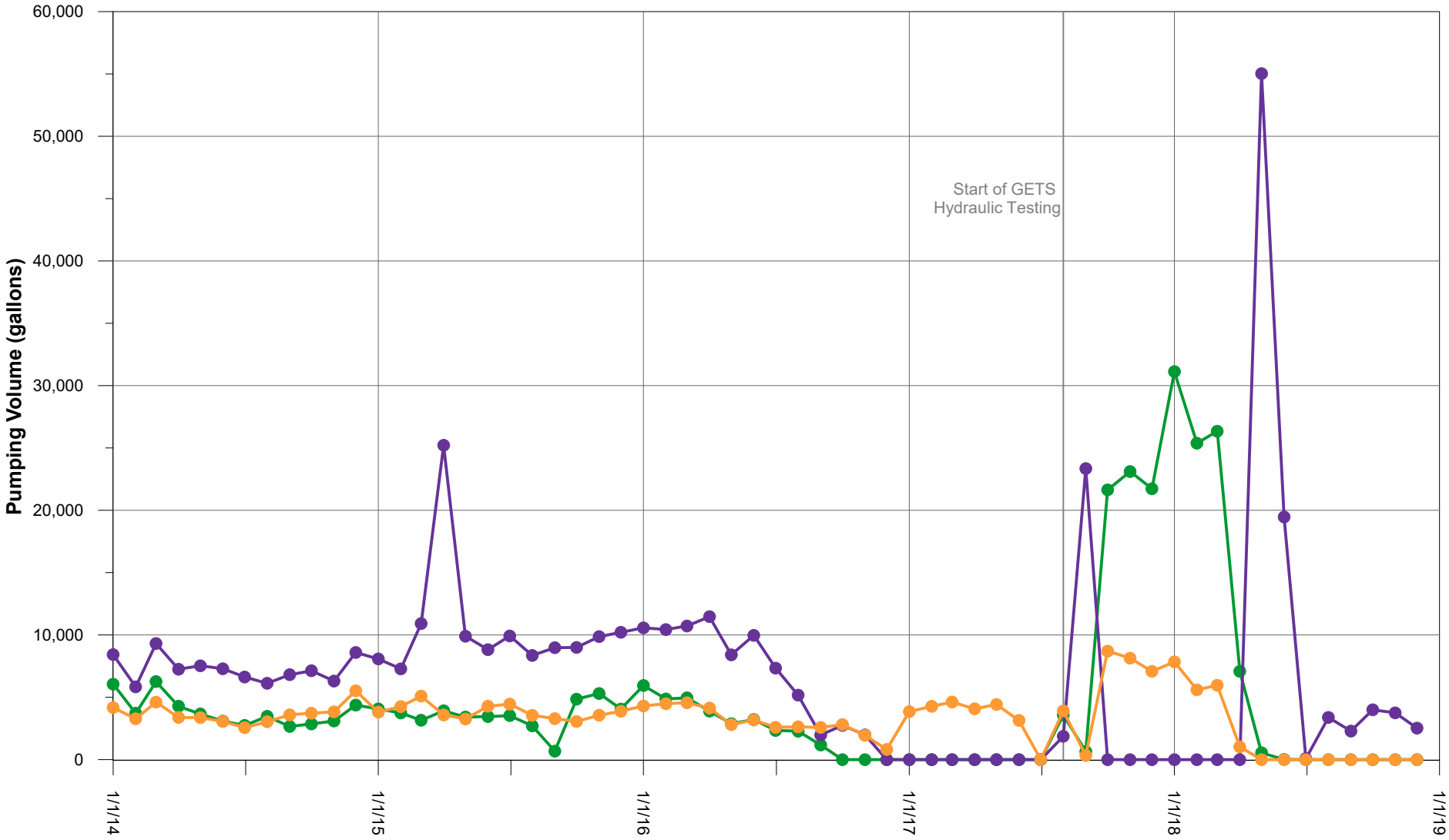
Legend:

EW-1, EW-2, EW-3, PW-21A, PW-22A, PW-23A, PW-24A, PW-27A, PW-28A, PW-50A, PW-51A, PW-52A, Detected Value, Non-detect Value

FIGURE 5
Feed Makeup Area
Fluoride Concentration Trends
ATI Millersburg Operations, Oregon

Notes:
mg/L = milligrams per liter
5-year rolling plot displays all wells in the provided timeframe. For historical data, see table in Attachment B.

GSI Water Solutions, Inc.



Legend:

- EW-1
- EW-2
- EW-3

FIGURE 6
Feed Makeup Area
Monthly Extraction Volumes
ATI Millersburg Operations, Oregon

Notes:
5-year rolling plot displays pumping volumes in the provided timeframe. For historical data, see Table 5.
In June 2017, a hydraulic test of the Groundwater Extraction and Treatment System (GETS) began. During which, extraction wells were turned on and off at several intervals.

GSI Water Solutions, Inc.

Attachment A
Well Construction Details

Table A-1. Extraction Area Well Contruction Details

ATI Millersburg Operations, Oregon

Station	Well Construction Data					Screen Depth		Screen Elevations		Regulatory Identification	Location Data		
Well	Borehole Diameter (inches)	Well Diameter (inches)	TOC Elevations (ft msl)	Stick Up (ft ags)	Bottom of Well Casing (ft bgs)	Top (ft bgs)	Bottom (ft bgs)	Top (ft msl)	Bottom (ft msl)	Date Constructed	Easting	Northing	Site Area ID
EW-1	10	4	209.77	--	34	21	31	188.77	178.77	1/14/2000	7534746.57	372294.70	Feed Makeup Area
EW-2	10	4	209.66	--	32	19	29	190.66	180.66	3/27/2000	7534713.54	372331.76	Feed Makeup Area
EW-3	10	4	210.18	--	33	20	30	190.18	180.18	3/28/2000	7534680.78	372366.13	Feed Makeup Area
PW-21A	8	4	209.36	2.46	23.3	11.3	21.3	198.06	188.06	4/18/1989	7534098.87	372759.67	Feed Makeup Area
PW-22A	8	4	210.37	2.27	29.0	17.0	27.0	193.37	183.37	4/14/1989	7534242.00	372503.00	Feed Makeup Area
PW-23A	8	4	212.02	2.52	34.6	22.6	32.6	189.42	179.42	4/12/1989	7534373.00	372257.00	Feed Makeup Area
PW-24A	8	4	212.05	2.15	31.8	19.8	29.8	192.25	182.25	4/7/1989	7534489.00	372011.00	Feed Makeup Area
PW-27A	8	4	210.99	-0.41	31.62	14.62	29.62	196.37	181.37	5/4/1989	7534766.00	372075.00	Feed Makeup Area
PW-28A	8	4	209.13	-0.17	32.0	20.0	30.0	189.13	179.13	4/28/1989	7534727.93	372339.59	Feed Makeup Area
PW-50A	10	4	209.08	0.8	32	20	30	189.08	179.08	10/19/1997	7534661.29	372364.16	Feed Makeup Area
PW-51A	10	4	209.27	-0.36	31	19	29	190.27	180.27	10/18/1997	7534744.58	372258.62	Feed Makeup Area
PW-52A	8	2	210.36	--	32	22	32	188.36	178.36	11/18/1999	7534773.56	372262.59	Feed Makeup Area
PW-102A	4	2	209.07	-0.54	30.7	15.7	30.7	193.37	178.37	5/29/2013	7534652.50	372415.71	Feed Makeup Area
PW-103A	4	2	211.02	-0.38	32	17	32	194.02	179.02	5/29/2013	7534767.74	372220.45	Feed Makeup Area
EW-4	10	4	210.00[1]	--	36	25	35	185.00	175.00	3/30/2000	7534792.58	371360.00	South Extraction Area
EW-5	10	4	208.92[1]	--	34.5	21	31	187.92	177.92	1/13/2000	7534785.04	371435.37	South Extraction Area
EW-6	10	4	208.70[1]	--	36	23	33	185.70	175.70	3/29/2000	7534746.56	371550.31	South Extraction Area
PW-25A	8	4	211.88	1.88	33.4	21.4	31.4	190.48	180.48	4/4/1989	7534651.00	371698.00	South Extraction Area
PW-26A	8	4	213.18	2.08	32.5	20.5	30.5	192.68	182.68	3/29/1989	7534777.00	371385.00	South Extraction Area
PW-29A	8	4	214.22	2.42	26.5	14.5	24.5	199.72	189.72	3/16/1989	7535286.00	371780.00	South Extraction Area
PW-47A	8	4	210.79	-0.31	27.5	15.0	25.0	195.79	185.79	9/26/1990	7534785.78	371509.24	South Extraction Area
PW-48A	8	4	214.5	-0.3	21.6	9.6	19.6	204.9	194.9	9/21/1990	7534875.00	371314.00	South Extraction Area
PW-49A	8	4	216.98	2.48	33.8	21.7	31.7	195.28	185.28	9/17/1990	7534830.00	371188.00	South Extraction Area
PW-57A	8	2	210.87	--	31	21	31	189.87	179.87	11/17/1999	7534748.98	371487.82	South Extraction Area
PW-96A	10	2	210.54	--	33.5	23.5	33.5	187.04	177.04	5/6/2008	7534770.43	371569.02	South Extraction Area
PW-97A	10	2	210.24	--	33.5	23.5	33.5	186.74	176.74	5/6/2008	7534729.88	371547.93	South Extraction Area

Notes:

[1] Elevation measured to top of well cap

-- = not available

ft ags = feet above ground surface

ft amsl = feet above mean sea level

ft bgs = feet below ground surface

TOC = top of casing

Attachment B

Feed Makeup Area Groundwater Quality Data

Table B-1. Feed Makeup Area Groundwater Data in 2009-2018

ATI Millersburg Operations, Oregon

Well	Analyte	Units	Cleanup Standard	Baseline July 2000	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Spring 2016	Fall 2016	Spring 2017	Fall 2017	Spring 2018	Fall 2018
PW-21A	Ammonium[1]	mg/L	250		31	93	33	28	31	18	30.9	69.2	20	45.7	14.6	70.7		13.8	57.1	26.1	98.3	56.1	114
PW-22A	Ammonium[1]	mg/L	250	**252**	**278**	**310**	**255**	234	**265**	236	73.2	127	134	77.4	68.6	160	157	145	59.2	123	108	117	107
PW-23A	Ammonium[1]	mg/L	250	81.5	43	79	42	36	35	29	64.8	51.6	39.2	43.6	39.4	38.6	37.9	41.6	38.3	38.3	39	52.8	38.4
PW-24A	Ammonium[1]	mg/L	250	**265**	190	68	180	156	165	148	81.2	40.7	61.9	77.4	122	60.5	96.1	187.5	84.1	52.6	161	158	184
PW-27A	Ammonium[1]	mg/L	250		25	6	22	18	20	18	11.9		15.7	20.2	26.6	7.58	9.11	22.5	25.5	18.3	18.6	19.5	10.7
PW-28A	Ammonium[1]	mg/L	250	**450**	205	**290**	190	157	167	145	**324**	**352**	**259**	173	170	**262**	234	145	210	221	139	173	6.01
PW-50A	Ammonium[1]	mg/L	250	161	41	35	0.33	0.18	0.33	0.14	32.1	11.1	19.9	12.4	26.3	3.77	19	44.4	26	7.24	13.2	10.1	63.3
PW-51A	Ammonium[1]	mg/L	250	195	60		55	44	48	28	73.2	95.2	69.5	107	106	88.4	101	157.5	141	125	102	119	109
PW-52A	Ammonium[1]	mg/L	250	**367**	193		185	175	131	175	101		92.6	184	140	128	122	145	149	140	112	114	178
EW-1	Ammonium[1]	mg/L	250	**316**	31	79	34	20	19	16	41.7	57	39.7	60.3	51.8	51.4	52.6	62.5	63.5	75.1	42	54.3	61.5
EW-2	Ammonium[1]	mg/L	250	**410**	64	59	60	40	53	25	42.7	75.2	49			66.7	58.7	69.9	84.3	64.1	70.1	49.0	50.3
EW-3	Ammonium[1]	mg/L	250	87.6	25	28	24	24	23	22	29.6	42.1	30.1	36.3	28.6	31	44.7	33.4	46.8	26.6	34.4	38.3	32.8
PW-21A	Arsenic	mg/L	0.01		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**0.0122** J	0.025 U	0.025 U	0.01 U	0.0002 J	0.01 U		0.0002 J	0.0001 J	0.0002 J	0.0005	0.001 U	0.001 U
PW-22A	Arsenic	mg/L	0.01	**0.0105**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0063 U	**0.0113** J	**0.0129** J	0.01 U	0.0007	0.0055 J	0.0046	0.0048	0.0091	0.0044	0.0041	0.0042	0.0044
PW-23A	Arsenic	mg/L	0.01	**0.124**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	**0.0501**	**0.0139** J	0.01 J	0.01 U	0.0061	**0.0152**	**0.0327**	0.0085	0.007	0.0065	0.0058	0.0049	0.0049
PW-24A	Arsenic	mg/L	0.01		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0063 U	0.025 U	0.0067 J	0.01 U	0.0006	0.01 U	0.0008	0.0007	0.0006	0.0003 J	0.0005 J	0.001 U	0.001 U
PW-27A	Arsenic	mg/L	0.01		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0063 U	**0.0118** J	**0.0124** J	0.01 U	0.0004	0.01 U	0.0004 J	0.0005 J	0.0009	0.0003 J	0.0004 J	0.001 U	0.001 U
PW-28A	Arsenic	mg/L	0.01	**0.239**	**0.14**	**0.14**	**0.12**	**0.11**	**0.09**	**0.09**	**0.331**	**0.109** J	**0.11**	**0.0109** J	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.0005 J	0.0008 J	0.0027	0.009
PW-50A	Arsenic	mg/L	0.01	**0.107**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0063 U	**0.0175** J	**0.0178** J	0.01 U	0.0011 J	0.0008 J	0.001 J	0.05 U	0.025 U	0.0009 J	0.0006 J	0.0015	0.0027 J
PW-51A	Arsenic	mg/L	0.01	**0.044**	0.02 U		0.02 U	0.02 U	0.02 U	0.02 U	0.0063 U	**0.017** J	**0.013** J	0.01 U	0.0006 J	0.05 U	0.0012	0.0004 J	0.0006	0.0011	0.0037	0.0015	0.0021
PW-52A	Arsenic	mg/L	0.01	**0.099**	0.02 U		0.02 U	0.02 U	0.02 U	0.02 U	**0.0106** J	**0.0292**	**0.0286**	0.01 U	0.05 U	0.05 U	**0.0175** J	0.05 U	0.025 U	0.01 U	0.025 U	0.0055	0.0089
EW-1	Arsenic	mg/L	0.01	**0.202**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0063 U	**0.0269**	**0.0361**	0.01 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.01 U	0.0007 J	0.0049	0.0031 J
EW-2	Arsenic	mg/L	0.01	**0.203**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.04**	**0.0194** J	**0.0332**	**0.0319**			0.05 U	0.05 U	0.0045 J	0.025 U	0.005 U	0.0025 U	0.0044	0.0033
EW-3	Arsenic	mg/L	0.01	**0.056**	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0063 U	**0.017** J	**0.0253**	0.01 U	0.0008 J	0.01 U	0.0012 J	0.05 U	0.025 U	0.0005 J	0.0003 J	0.0012	0.005 U
PW-21A	Cadmium	mg/L	0.005		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0003 J	0.005 U	0.005 U	0.0005 U	0.0005 U	0.01 U		0.005 U	0.0005 U	0.0005 U	0.0005	8E-05 J	8E-05 J
PW-22A	Cadmium	mg/L	0.005	0.0003 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0002 U	0.0003 J	0.0003 J	0.0005 U	0.0005 U	0.01 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0002 U	0.0002 U
PW-23A	Cadmium	mg/L	0.005	0.0003 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0003 J	0.005 U	0.005 U	0.0005 U	0.0005 U	0.01 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0002 U	0.0002 U
PW-24A	Cadmium	mg/L	0.005		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0002 U	0.005 U	0.005 U	0.0006 J	0.0005 U	0.01 U	0.0005 U	0.0005 U	0.0002 J	0.0005 U	0.0005 U	4E-05 J	5E-05 J
PW-27A	Cadmium	mg/L	0.005		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0004 J	0.0005 J	0.005 U	0.0005 U	0.0002 J	0.01 U	0.001 U	0.0001 J	0.0002 J	4E-05 J	0.0005 U	7E-05 J	7E-05 J
PW-28A	Cadmium	mg/L	0.005	**0.0361**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.0182** J	**0.0255**	**0.0217**	**0.0072**	0.078 U	**0.196**	**0.0655**	0.05 U	0.05 U	0.0009 J	0.005 U	**0.0059**	**0.0273**
PW-50A	Cadmium	mg/L	0.005	**0.025**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0013 J	0.002 J	0.0015 J	0.0005 U	0.0014 J	0.0017 J	**0.0114** J	0.05 U	0.025 U	**0.0447**	**0.0583**	**0.0253**	**0.0057**
PW-51A	Cadmium	mg/L	0.005	**0.0127**	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.0019 J	0.0023 J	0.0012 J	0.0005 U	0.005 U	0.01 U	0.0001 J	0.0007	0.0011	0.0012	0.0007 J	0.0011	0.0012
PW-52A	Cadmium	mg/L	0.005	**0.0171**	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.0034 J	0.0049 J	0.0035 J	0.0006 J	**0.021**	**0.0469**	**3.07**	0.05 U	**0.0088** J	**0.0067**	0.0039 J	**0.0056**	**0.0063**
EW-1	Cadmium	mg/L	0.005	**0.0229**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.0058**	**0.0072**	**0.0062**	0.0033 J	**0.0092**	**0.0109**	**0.0146**	0.05 U	0.05 U	**0.0084** J	**0.0088**	**0.0098**	**0.0086**
EW-2	Cadmium	mg/L	0.005	**0.0465**	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	**0.0052**	**0.0072**	0.0045 J			**0.271**	**0.108**	**0.911**	**0.0815**	**0.0546**	**0.0346**	**0.0216**	**0.0177**
EW-3	Cadmium	mg/L	0.005	**0.026**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0016 J	0.0015 J	0.0011 J	0.0013 J	**0.0051**	**0.0069** J	**0.0266**	0.05 U	0.025 U	0.0018 J	0.0022	0.0015	0.0016
PW-21A	Chloride	mg/L	none		10 U	10 U	10 U	10 U	10 U	10 U	83.2	8.55	5.04	4.7	3.71	7.14		3.02	7.31	3.16	15.5	7.63	24.5

Table B-1. Feed Makeup Area Groundwater Data in 2009-2018

ATI Millersburg Operations, Oregon

Well	Analyte	Units	Cleanup Standard	Baseline July 2000	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Spring 2016	Fall 2016	Spring 2017	Fall 2017	Spring 2018	Fall 2018
PW-22A	Chloride	mg/L	none	19,034	588	640	572	561	546	489	138	195	276	225	112	295	448	227	35.9	160	152	134	146
PW-23A	Chloride	mg/L	none	194	102	73	98	87	87	69	55.8	44	43.6	43.7	46.3	35.8	54.9	26.7	16.6	23.8	27.7	28.4	23.2
PW-24A	Chloride	mg/L	none	162	96	82	95	78	83	78	64	25.4	67.9	86.6	126	53.5	93.1	346	55.9	55.8	124	99.1	176
PW-27A	Chloride	mg/L	none		1,580	1,000	1,475	1,300	1,520	1,280	506	311	878	842	714	936	1,070	641	623	483	545	436	471
PW-28A	Chloride	mg/L	none	9,920	5,600	8,100	5,400	3,800	5,200	3,710	12,200	12,200	7,680	7,610	7,910	5,900	4,680	3,370	4,510	3,010	3,030	3,820	103
PW-50A	Chloride	mg/L	none	8,362	1,050	420	980	760	755	770	1,220	1,280	1,090	1,510	1,230	1,240	1,620	661	1,110	1,090	1,140	1,090	1,370
PW-51A	Chloride	mg/L	none	5,030	1,380		1,365	1,265	1,265	1,165	1,050	1,180	894	890	627	512	1,090	565	651	805	1,060	891	851
PW-52A	Chloride	mg/L	none	9,310	3,450		3,500	2,600	3,410	2,530	2,400	2,640	2,900	4,220	2,300	2,080	2,810	2,150	2,000	1,810	1,900	1,800	1,880
EW-1	Chloride	mg/L	none	8,830	3,250	3,300	3,180	2,785	3,260	2,560	3,030	2,970	2,910	3,900	2,530	2,160	3,540	2,380	2,820	2,930	1,900	2,170	2,440
EW-2	Chloride	mg/L	none	19,030	3,950	3,500	4,150	3,850	3,890	3,760	3,090	3,840	2,860			2,720	3,730	2,150	2,540	2,110	2,280	1,970	2,350
EW-3	Chloride	mg/L	none	7,749	1,480	1,300	1,375	1,268	1,275	1,270	1,220	929	852	1,040	866	904	2,190	1,190	463	735	786	395	527
PW-21A	Fluoride	mg/L	4		1.2	2	1.1	1	1.1	1.1	**6.66**	1.21	0.46	1.28	0.448 J	1.78		0.46 J	1.82	0.52 J	2.16	1.54	2.66
PW-22A	Fluoride	mg/L	4	10 U	3.1	2	2.6	2.5	2.4	2.4	3.18	2.25	2.23	1.21	1.91	3.53	2.97	2.59	2.71	2.94	2.01	3.32	3
PW-23A	Fluoride	mg/L	4	**13.6**	**17**	**21**	**14**	**12**	**12**	**11**	**19.5**	**22.3**	**15.3**	**16.8**	**17.1**	**24.4**	**26.1**	**22.8**	**23.4**	**23.6**	**25**	**23**	**25.2** J
PW-24A	Fluoride	mg/L	4	**4.6**	1 U	1 U	1 U	1 U	1 U	1 U	0.56	0.69	0.84	0.707	0.693 J	0.605 J	0.66 J	0.79 J	0.727 J	0.84 J	0.51 J	1.00 U	1.00 U
PW-27A	Fluoride	mg/L	4		1 U	1 U	1 U	1 U	1 U	1 U	0.1	0.11	0.023 J	0.0103 U	1 U	0.0437 J	0.0555 U	0.43 J	0.0934 J	0.11 U	1 U	1.00 U	1.00 U
PW-28A	Fluoride	mg/L	4	**12.9**	1 U	**12**	1 U	1 U	1 U	1 U	**24.6**	**6.84**	0.79	**19.6**	**7.61**	0.118 J	0.158 J	2.89	3.41	**4.13** J	**10.4**	100 U	1.05
PW-50A	Fluoride	mg/L	4	**12.4**	1.1	2	1 U	1 U	1 U	1 U	2.63	1.29	2.43	1.02	2.69	0.775 J	1.31	2.48 J	1.8	1.57 J	1.26	1.08	**6.03**
PW-51A	Fluoride	mg/L	4	**148**	1.5		1.4	1.2	1.2	1.1	3.66	**4.99**	2.69	0.404	0.286 J	0.413 J	0.752 J	1.09 J	1.19	1.26 J	1.08	1.18	1.28
PW-52A	Fluoride	mg/L	4	**30.2**	0.21		0.18	0.16	0.16	0.15	**9.5**	2.9	**8.74**	**13.7**	**15.9**	3.34	1.73	**9** J	**11.5**	**11.9** J	**9.84**	**17.8**	1.00 U
EW-1	Fluoride	mg/L	4	**40.8**	1.2	**24**	1.1	1	1.2	1.2	**12.9**	**11.7**	**13.5**	**8.16**	**10**	2.99	3.28	**9.76** J	**13.3**	**12.4** J	**9.94**	1.00 U	**11.2**
EW-2	Fluoride	mg/L	4	**12.7**	0.1 U	**6**	0.1 U	0.1 U	0.1 U	0.1 U	0.52	1.99	3.98			0.199 J	0.431 J	**4.54** J	**6.34**	3.62 J	2.99	1.00 U	1.98
EW-3	Fluoride	mg/L	4	**31.3**	**5.1**	**7**	**4.2**	3.8	3.8	3.3	**13.4**	**9.85**	**5.41**	**8.43**	**5.89**	**5.35**	**6.66**	3.99 J	**23.1**	3.68 J	**11.4**	**6.16**	**15.2**
PW-21A	Iron	mg/L	none															0.1 U					
PW-22A	Iron	mg/L	none	20.2														6.82					
PW-23A	Iron	mg/L	none	19.9														1.03					
PW-24A	Iron	mg/L	none	1 U														0.0473 J					
PW-27A	Iron	mg/L	none															0.1 U					
PW-28A	Iron	mg/L	none	1,450														561					
PW-50A	Iron	mg/L	none	599														27.6					
PW-51A	Iron	mg/L	none	55.1														0.361					
PW-52A	Iron	mg/L	none	471														43					
EW-1	Iron	mg/L	none	932														6.57					
EW-2	Iron	mg/L	none	1,390														11.8					
EW-3	Iron	mg/L	none	172														16					
PW-21A	Manganese	mg/L	none[2]		0.23	0.47	0.21	0.2	0.19	0.18	0.174	0.346	0.224	0.29	0.0839	0.468		0.0575	0.491	0.125			
PW-22A	Manganese	mg/L	none[2]	3.53	2.4	3	2.36	2.11	2.31	2.01	1.5	1.86	1.72	2.1	1.8	1.64	2.46	1.79	1.08	1.17			

Table B-1. Feed Makeup Area Groundwater Data in 2009-2018

ATI Millersburg Operations, Oregon

Well	Analyte	Units	Cleanup Standard	Baseline July 2000	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Spring 2016	Fall 2016	Spring 2017	Fall 2017	Spring 2018	Fall 2018
PW-23A	Manganese	mg/L	none[2]	4.65	5.2	4.6	4.9	4.7	4.7	4.5	3.36	2.45	2.79	3.03	2.63	2.34	2.6	2.14	1.59	1.6			
PW-24A	Manganese	mg/L	none[2]	9.11	0.98	0.81	0.78	0.67	0.61	0.58	2.17	0.402	0.916	1.6	3.68	1.56	2.51	4.87	1.83	1.27			
PW-27A	Manganese	mg/L	none[2]		1.3	1.2	1.2	1.1	1.1	1	1.22	1.38	1.19	1.07	1.55	0.676	0.5	1.17	0.888	1.01			
PW-28A	Manganese	mg/L	none[2]	18.2	18	23	16	14	15	12	81.6	53.6	43.7	37.9	24.2	33.5	30.6	16.6	25.6	18.6 J			
PW-50A	Manganese	mg/L	none[2]	107	15.4	3.7	14.8	13.6	13.3	12.8	9.11	13.7	13.6	15	1.35	16.1	16.5	8.8	14.5	14.2 J			
PW-51A	Manganese	mg/L	none[2]	58.4	18.6		17.5	16.8	16.3	15.7	13.3	13.4	12.5	5.43	6.38	4.78	8	8.22	8.25	9.83 J			
PW-52A	Manganese	mg/L	none[2]	48	25.6		24.8	22.2	22.9	22.1	18.5	18.1	17.6	21.3	20.8	19.6	17.6	17.1	21.3	20.8 J			
EW-1	Manganese	mg/L	none[2]	36.7	72	63	68	60	59	55	56.3	54.5	57.8	53	51.4	48.5	49.4	52.8	46.2	55.5 J			
EW-2	Manganese	mg/L	none[2]	16.8	18	28	17	16	16	16	43.6	41.1	49.8			39.2	47.2	31.8	33.9	35.3 J			
EW-3	Manganese	mg/L	none[2]	156	18.2	16	17.8	16.5	16.1	16.2	35.8	30.2	31.4	28.5	27.3	23.9	41.9	19.9	12.1	16.5 J			
PW-21A	Nickel	mg/L	2		0.02	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U		0.02 U		0.0062 J	0.0016	0.0076		0.0005 U	0.0097	0.0027	0.0092	0.0054	0.0098
PW-22A	Nickel	mg/L	2	0.2 U	0.02	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0038 U	0.02 U		0.0025 U	0.0008	0.0097 J	0.0014	0.0005 U	0.0006	0.0007	0.0008	0.001 U	0.001 U
PW-23A	Nickel	mg/L	2	0.2 U	0.02	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0038 U	0.02 U		0.0025 U	0.0008	0.0007 J	0.0007	0.0005 U	0.0007	0.0003 J	0.0004 J	0.001 U	0.001 U
PW-24A	Nickel	mg/L	2	0.2 U	0.02	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0038 U	0.02 U		0.0064 J	0.0075	0.0025 J	0.0048	0.0005 U	0.0039	0.0032	0.005	0.0013	0.0028
PW-27A	Nickel	mg/L	2		0.02	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0038 U	0.0024 J		0.0039 J	0.0092	0.0077 J	0.0058	0.0001 J	0.0121	0.0047	0.0049	0.0021	0.001 J
PW-28A	Nickel	mg/L	2	**6.25**	1.8	**3.4**	1.5	1.25	1.4	1.16		**3.63**		1.5	0.922	1.37	1.21	0.05 U	0.805	0.637 J	0.55	0.875	0.0309
PW-50A	Nickel	mg/L	2	**3**	0.25	0.13	0.23	0.15	0.21	0.12		0.1		0.109	0.162	0.0648	0.254 J	0.05 U	0.155	0.0632 J	0.0549	0.068	0.497
PW-51A	Nickel	mg/L	2	2 U	0.3		0.25	0.22	0.19	0.22	0.3	0.327		0.0287	0.075	0.0368	0.0824	0.0007	0.141	0.131	0.0879	0.0978	0.069
PW-52A	Nickel	mg/L	2	**3.54**	1.6		1.3	1.1	1.1	1.1	0.913	0.835		1.17	1.14	1.04	0.907	0.05 U	0.857	0.899 J	0.685	0.689	0.964
EW-1	Nickel	mg/L	2	**3.98**	0.95	0.82	0.77	0.75	0.69	0.66		0.722		0.664	0.681	0.625	0.644	0.05 U	0.634	0.786 J	0.344	0.611	0.743
EW-2	Nickel	mg/L	2	**5.65**	1.7	1.8	1.6	1.5	1.5	1.4		1.06				0.988	0.919	0.911	0.755	0.664 J	0.362	0.63	0.716
EW-3	Nickel	mg/L	2	**2.58**	0.23	0.24	0.22	0.21	0.18	0.18		0.147		0.138	0.126	0.146	0.594	0.05 U	0.212	0.0779 J	0.0912	0.119	0.161
PW-21A	TDS	mg/L	none		255	250	310	290	320	270	352	313	264	440	167	305		259	390		282	330	456
PW-22A	TDS	mg/L	none	898	955	840	1,050	1,020	1,030	980	280	263	747	412	320	482	805	540	202	369	354	380	346
PW-23A	TDS	mg/L	none	1,000	684	550	630	525	622	489	312	305	337	369	281	277	298	261	214	180	211	236	210
PW-24A	TDS	mg/L	none	1,590	420	270	430	425	418	420	576	174	272	469	1,030	424	812	1,200	455	362	969	808	2,240
PW-27A	TDS	mg/L	none		2,200	2,100	1,800	1,450	1,780	1,380	2,420	2,450	2,940	2,730	2,790	2,880	2,550	2,430	2,080	1,520	1,690	1,750	1,570
PW-28A	TDS	mg/L	none	16,300	13,800	14,000	12,600	11,800	12,300	10,700	16,300	11,700	11,000	9,660	10,200	9,280	7,590	5,880	7,970	5,470	5,190	6,480	198
PW-50A	TDS	mg/L	none	12,900	2,010	760	1,920	1,870	2,010	1,920	1,920	2,520	2,620	3,010	2,770	2,920	3,100	1,580	2,940	3,200	2,820	3,560	2,540
PW-51A	TDS	mg/L	none	8,230	2,840		2,950	2,846	2,715	2,670	2,430	2,620	2,500	2,700	2,460	1,850	2,660	2,300	2,200	2,500	2,990	3,140	3,660
PW-52A	TDS	mg/L	none	11,800	4,650		4,450	3,950	4,280	3,740	3,620	4,230	5,500	4,500	5,470	4,100	3,970	4,580	3,580	17,600	3,360	3,790	363
EW-1	TDS	mg/L	none	12,700	5,580	4,700	5,470	5,060	5,530	5,120	5,580	4,490	5,560	5,230	5,900	4,630	5,020	5,400		4,810	4,480	6,580	4,380
EW-2	TDS	mg/L	none	15,700	6,810	5,100	6,950	5,440	5,820	5,550	4,430	4,250	5,230			4,350	4,460	4,350	4,030	3,540	3,610	4,350	3,830
EW-3	TDS	mg/L	none	11,700	2,860	2,300	2,980	2,750	2,860	2,640	3,500	3,110	3,420	3,170	3,260	2,920	4,190	3,350	1,410	2,150	2,240	2,010	1,440
PW-21A	Radium-226	pCi/L	5[3]		**3.2**	40 U	1.5	1.4	0.21 J	0.18 J	**1.5**	**1.9**	0.04 U	0.46	0.43	1.2		0.67	1.2	1.2	**2.2**	0.13	**1.4**
PW-22A	Radium-226	pCi/L	5[3]	0.2	**3.3**	40 U	0.83	0.75	0.12 J	0.11 J	0.59	1.2	0.2	-0.06	0.18	0.39	0.3	0.19	0.41	0.12 J	0.13 U	0.17	0.13 J
PW-23A	Radium-226	pCi/L	5[3]	**13**	1.4	40 U	0.12 J	0.1 J	0.01 J	0.01 J	1	0.58	0.04 U	0.1	-0.001	0.31	0.5	0.02	-0.02	0.06 J	0.04 U	0.13	0.15 J

Table B-1. Feed Makeup Area Groundwater Data in 2009-2018

ATI Millersburg Operations, Oregon

Well	Analyte	Units	Cleanup Standard	Baseline July 2000	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Spring 2016	Fall 2016	Spring 2017	Fall 2017	Spring 2018	Fall 2018
PW-24A	Radium-226	pCi/L	5 [3]		**2.4**	40 U	0.1 J	0.2 J	0.12 J	0.06 J	0.33	0.46	0.06 U	0.04	0.11	0.04	0.2	0.06	0.07	0.05 J	0.13 U	0.13	0.13 J
PW-27A	Radium-226	pCi/L	5 [3]		2.4	40 U	0.15 J	0.12 J	0.02 J	0.01 J	0.62	1.5	0.2	0.09	0.03	0.62	0.3	0.08	0.1	0.2 J	0.03 U	0.13	0.13 J
PW-28A	Radium-226	pCi/L	5 [3]	**69**	**25**	**40** U	**65**	**32**	1.1 J	1.13 J	**100**	**130**	**47.5**	**17**	**21**	**25**	**35.3**	**8.4**	**11**	**8.3**	**17**	**19**	0.53
PW-50A	Radium-226	pCi/L	5 [3]		**6.5**	40 U	0.75	0.67	0.04 J	0.03 J	**1.7**	**6.8**	**1.8**	**1.2**	**1.7**	**0.67**	**2.1**	1.3	0.74	0.44	0.5	**2**	**1**
PW-51A	Radium-226	pCi/L	5 [3]	0.5	2.1		0.39 J	0.31 J	0.21 J	0.18 J	0.51	1.8	0.1	0	0.06	0.34	0.4	0.22	0.12	0.2	0.62	0.2	0.38
PW-52A	Radium-226	pCi/L	5 [3]	**12**	**3.2**		**3.1**	2.1	0.06 J	0.05 J	**2.3**	**13**	1.6	0.42	1.8	1.7	**3.3**	0.38	0.25	0.29	0.25	0.27	**0.35**
EW-1	Radium-226	pCi/L	5 [3]	**51**	**3.5**	40 U	1.6	1.5	0.01 J	0.01 J	1.7	**5.8**	1.1	0.72	0.9	**1.1**	**1.8**	0.58	0.52	1.1	0.71	0.92	**0.67**
EW-2	Radium-226	pCi/L	5 [3]	**68**	**35**	40 U	**18**	**12**	0.11 J	0.12 J	**14**	**47**	**8.2**			**14**	**10.6**	6.3	**7.7**	**7.6**	**10**	**4.7**	**3.3**
EW-3	Radium-226	pCi/L	5 [3]	**6.2**	**2.5**	40 U	**3.3**	**2.3**	0.22 J	0.23 J	0.22	0.85	0.2	0.14	0.16	0.48	**2.2**	0.18	0.09	0.18	0.43	0.06	0.05
PW-21A	Radium-228	pCi/L	5 [3]		**2.1**	40 U	0.92 J	0.84 J	0.11 J	0.07 J	**4.3**	**6.8**	0.2 U	2.4	-0.3	1.2		1.4	3.1	1.5	**3.6**	0.65	**4.1**
PW-22A	Radium-228	pCi/L	5 [3]	1.4	**2.4**	40 U	0 J	0.1 J	0.11 J	0.11 J	1.4	1.8	0.4 U	1.9	-0.2	0.45	0.7 U	0.39	0.22	0.11	-0.09 U	0.64	1.5
PW-23A	Radium-228	pCi/L	5 [3]	**2.6**	1.6	40 U	0 J	0.05 J	0.01 J	0.01 J	2.5	2.3	0.2 U	1.4	-1	-0.3	1.4	0.45	0.34	0.08	0.23 U	0.17	1.5
PW-24A	Radium-228	pCi/L	5 [3]		**3.1**	40 U	0.29 J	0.2 J	0.11 J	0.05 J	1.3	0.8	0.2 U	1.1	-0.07	1.4	0.7 U	-0.94	0.24	-0.2	-0.3 U	1.4	-0.79
PW-27A	Radium-228	pCi/L	5 [3]		2.1	40 U	1.5	1.3	0.05 J	0.04 J	3.1	0.2	0.6 U	3.3	-0.1	1.4	1.5	1.4	0.45	0.05	-0.21 U	0.65	1.2
PW-28A	Radium-228	pCi/L	5 [3]	**140**	**12**	**54**	**11**	**5**	1.12 J	1.4 J	**17**	**9.3**	**56.5**	**32**	**34**	**54**	**42.6**	**13**	**23**	**15**	**19**	**27**	1.4
PW-50A	Radium-228	pCi/L	5 [3]		**5.3**	40 U	1.9	1.7	0.02 J	0.02 J	**4.1**	**3.9**	**4.4**	**5.3**	**6.8**	**4.7**	**6**	3.3	4.2	2.4	2.5	**7.4**	**9.3**
PW-51A	Radium-228	pCi/L	5 [3]		2.6		0.59 J	0.49 J	0.11 J	0.1 J	1.2	1.3	0.3 U	0.05	0.55	0.77	1.5	0.42	-0.3	0.49	0.7 U	1.2	0.33
PW-52A	Radium-228	pCi/L	5 [3]	**9.3**	**1.8**		**2.7**	2.7	0.11 J	0.08 J	**2.9**	**2.3**	2.6	3	2.3	0.71	**4.2**	-0.02	3.2	1.9	1.6	3.7	**5.1**
EW-1	Radium-228	pCi/L	5 [3]	**14**	**5.9**	40 U	3.1	3.2	0.01 J	0.01 J	2.4	**4.9**	1.8	2.2	3.5	**4.5**	**4**	1.8	2.9	2.7	1.3	3.9	**7.1**
EW-2	Radium-228	pCi/L	5 [3]	**150**	**21**	55 U	**14**	**16**	0.56 J	0.47 J	**11**	**8.8**	**24.4**			**31**	**17**	**16**	**23**	**18**	**14**	**15**	**19**
EW-3	Radium-228	pCi/L	5 [3]	**0**	**3.6**	40 U	**4.1**	**3.3**	0.18 J	0.17 J	1.6	1.2	0	0.4 J	1.5	1.6	**3.2**	1	0.5	0.55	0.63 U	0.39	0.1

Notes:

[1] From 2002 to 2008, CH2M HILL reported this constituent as Ammonia/Ammonium.

[2] Standard modified in 2010 to reflect Oregon Environmental Quality Commission's removal of risk-based manganese freshwater criteria.

[3] Radium exceeds cleanup level if total of Radium-226 and Radium-228 exceeds 5 pCi/L.

J = estimated value below method reporting limit

mg/L = milligram per liter

pCi/L = picocuries per liter

TDS = total dissolved solids

U = analyte not detected above method reporting limit

10-year rolling table. Refer to past annual reports for a full record of historical concentrations.

Blank cells indicate no analysis performed.

Fall 2015 biannual sampling event was postponed during negotations and scheduling of the sitewide groundwater and surface water sampling event that occurred in spring 2016.

Bold indicates that the concentration meets or exceeds the cleanup standard. Refer to Quality Assurance Project Plan for Sitewide Remedial Action Table B-4 for more details (GSI, 2015b).